

We claim:

1. A process for preparing impact-modified polystyrene by anionic polymerization, which comprises

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- 1) preparing a rubber solution from diene monomers, or from diene monomers and styrene monomers, by anionic polymerization, using an organyllithium compound as initiator, and with concomitant use of a solvent,

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- 2) adding, to the resultant rubber solution, an organylaluminum compound, its amount being such that the aluminum/lithium molar ratio in the rubber solution is greater than 1 or, if the organylaluminum compound used comprises a dialkylaluminum phenolate, is greater than 0.5,

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- 3) adding styrene monomer to the resultant solution, and

- 4) adding, to the resultant mixture, organyllithium compound, or organyllithium compound and organylaluminum compound, the amount being such that the aluminum/lithium molar ratio in the mixture is smaller than 1 or, if the organylaluminum compound used comprises a dialkylaluminum phenolate, is smaller than 0.5, and polymerizing the mixture anionically.

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2. A process as claimed in claim 1, wherein, during the preparation of the rubber solution in stage 1), no concomitant use is made of compounds which have a retarding action on the anionic polymerization.

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3. A process as claimed in claim 1 or 2, wherein the diene monomer used comprises butadiene and the styrene monomer used comprises styrene.

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4. A process as claimed in any of claims 1 to 3, wherein the rubber has been selected from polybutadiene and styrene-butadiene block polymers.

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5. A process as claimed in any of claims 1 to 4, wherein the styrene-butadiene block copolymer rubber comprises at least one butadiene block with a weight-average molar mass of from 50 000 to 250 000 g/mol.

6. A process as claimed in any of claims 1 to 5, wherein the butadiene content of the rubber is from 70 to 100% by weight.
7. A process as claimed in any of claims 1 to 6, wherein the solids content of the rubber solution obtained in stage 1) is from 20 to 40% by weight.
8. A process as claimed in any of claims 1 to 7, wherein the solids content of the mixture obtained in stage 3) is from 5 to 25% by weight.
- 10 9. A process as claimed in any of claims 1 to 8, wherein the aluminum/lithium molar ratio of the solution obtained in stage 2) is from 1.01 to 10 or, if the organylaluminum compound used comprises a dialkylaluminum phenolate, is from 0.51 to 10.
- 15 10. A process as claimed in any of claims 1 to 9, wherein the aluminum/lithium molar ratio of the mixture obtained in stage 4) is from 0.5 to 0.99 or, if the organylaluminum compound used comprises a dialkylaluminum phenolate, is from 0.2 to 0.49.
- 20 11. A process as claimed in any of claims 1 to 10, wherein further styrene monomer is added in stage 4) prior to or during the polymerization.